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ABSTRACT

Development of Clothes Dryer Machine is a project that suggested by the lecturer Faculty of Mechanical Engineering for Final Year Project title. This project focusing in designing and fabricating including develop the system and also the body structure. The objective of the project is to develop and improve the Clothes Dryer Machine. To achieve the project objective, the Clothes Dryer Machine needs to have all the criteria including aspect of strength, safety and ergonomic. To making the project a success, flow of work should been follow start by designing, analysis and lastly fabricating.

Diploma Final Year Project will take the whole semester to complete this project. This is an individual project that the candidate has to do it by ourselves. This project also give the opportunity to the candidate to apply their knowledge's and skills in using either machinery or even computer software for designing and analysis. In this project, time management is the important things to make sure the project is done correctly according to the planning. It also a step to run the progress better and in the linear progress works. So, overall from this project is to make a superior project we need high discipline and also candidate interested to finish this Final Year Project.

ABSTRAK

Memajukan Mesin Pengering Pakaian adalah sebuah projek yang dicadangkan oleh pensyarah Fakulti Kejuruteraan Mekanikal untuk tajuk Projek Tahun Akhir. Projek ini tertumpu dalam mereka bentuk dan pembinaan termasuk pembinaan sistem dan struktur badan. Objektif projek ini adalah untuk memaju dan menambah baikkan Mesin Pengering Pakaian. Untuk mencapai objektif projek ini, Mesin Pengering Pakaian harus mempunyai semua kriteria termasuklah dari aspek kekuatan, keselamatan dan ergonomic. Untuk menjadikan projek ini satu kejayaan, aliran kerja haruslah diikut bermula dari reka bentuk, analisis dan akhir sekali pembinaan.

Projek Tahun Akhir Diploma ini akan megambil sepanjang semester untuk disiapkan. Projek ini adalah projek individu dimana calon harus menyelesaikannya dengan sendiri. Projek ini turut memberi peluang untuk calon mengaplikasi pengetahuan dan kemahiran mereka dalam menggunakan mesin mahupun perisian komputer untuk mereka bentuk dan analisis. Dalam projek ini, pengurusan masa adalah penting untuk memastikan projek berjalan dengan betul berdasarkan perancangan. Ini juga langkah untuk menjalankan perkembangan projek lebih baik dan dalam perkembangan kerja yang berterusan. Jadi, kesimpulan dari projek ini adalah untuk membina projek yang mantap kita perlulah mempunyai disiplin yang tinggi dan calon juga berminat untuk menyiapkan Projek Tahun Akhir ini.

TABLE OF CONTENTS

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

θ	Diameter
“	Inch
∑	Sum
̊c	Celsius
N-m	Moment units
N	Force units
m	Length units
kg	Mass units

LIST OF ABBREVIATIONS

GMAW	Gas metal arc welding
MIG	Metal inert gas
MAG	Metal active gas
RM	Ringgit Malaysia
FOS	Factor of Safety

CHAPTER 1

INTRODUCTION

1.1 PROJECT SYNOPSIS

The project is about to develop a clothes dryer machine. This project will make the differences between the dryer machines in the current market that is basically only spinning concept to remove moisture. By this semester 1 08/09 Final Year Project will be invented using all the method that has been learn through the previous semester, that is include the subjects that have been learned and also the machinery that has been used. This Final Year Project must finish and achieve the target by the end of this semester. Besides that, this Final Year Project will be able to give the student a bunch of knowledge and skills in using the machinery. Furthermore, this also can be the step of learning and also be able to know how to apply their understanding to solve the problem that appear.

1.2 PROBLEM STATEMENT

The problems that usually face in current time is base on the customer need. Although this Final Year Project not willing to compete with the product nowadays but it apply our skill to develop machine that can fulfill the needed. Usually the issues that always been claims are:

I. The product must be economic and efficient in manner.
II. Must be energy efficient.
III. The type of machine also must be consider although gas or electric dryer.

IV. How hot the machine can produce and how long it will take time to dry the cloths.
V. The size also take place, bigger is not necessarily when it comes to clothes dryer.
VI. The looking of the dryer machine.

1.3 PROJECT OBJECTIVES

The project is about to develop a clothes dryer machine that using bulb as the medium of dryer and also moveable with wheel. The project required all the skill and knowledge about metal rod and plate, connecter, engine (optional), mechanical design and also welding skills. The project objectives as follows:

I. Develop the Clothes Dryer Machine that can dry clothes in a short time.
II. Design the Clothes Dryer Machine with suitable shape.
III. Analysis the beam structure (rod that support the load of clothes) of the machine.
IV. The time taken to dry the clothes using material that has been choose.

1.4 PROJECT SCOPES

The project is about to design the mechanical part of machine and to fabricate the mechanical part of the system from the title that has been given. Besides that it is also need to apply all the knowledge and skill that require to make it done. In order to achieve the main objective there are some guide that must be follow to successfully done the project:

I. **Literature**
- The literature is including doing the research about the Clothes Dryer Machine. The sources are the journal from sciencedirect, search from internet and also people around.

II. **Design concept**

- Four (4) design concepts had been sketched. Before analyzing using metrics chart and Pugh concept, some criteria had been considered first. After that, the final concept will come out from the analysis tools
- The fabrication process will refer to the design concept that has been produce with their dimensions and criteria.

III. **Detail drawing**

- Detail drawing was developed from the final concept. The project feature will be more easy to understand and also used for the next steps of the project.

IV. **Fabricate**

- Fabrication is one of the most important parts in this project. The fabrication will only achieve when the analysis, material, and detail drawing had been finished. The fabrication process also includes the welding process, fastening, machinery and many more. While doing this part, all the knowledge's and skills will be applied.

V. **Report**

- The report will submit to the lecturer after all the information and all the work have done. The report consist all the work that have been done through the semester. The presentation slide also must been done while making the report. So that at the end of the project the presentation will take placed.

VI. **Others**

- The produce size that in planning is 1.4 m with a θ 0.6 m
- Load can be applied up to 5 kg.
- Using bulb as medium of drying.
- Moveable with wheel attached.

- Easy to install or replaced part.
- Time that takes to dry the 5 kg moist fabrics.
- The materials that use to build up the machine are aluminum sheet, ductile iron rod, hollow steel (½"x ½") and fastener.

1.5 PROJECT BACKGROUND

The clothes dryer machine also known as tumble machine used to dry a load of moisture textiles. There are many types that have been released in the market. Their purpose and function kindly the same and most of them used spinning concept as their way to remove moist from the clothes. Besides that, there are many shapes and sizes come with several of load that can be fill in the machine. Basically, majorities of the machine are unmovable and also difficult to replace the equipment that brake down. Develop a machine that can fulfill those criteria are the objective of this Final Year Project.

1.6 PROJECT SCHEDULES

This Final Year Project will be arranged through this semester with advice from supervisor En Zulkifli B Ahmad@Manap. It starts from week 1 until week 16. The planning process is to make sure the project run smooth and finished before the due date. Besides that, these also use to manage the objective and solve the task without having problems of time. Candidate can teach their self to arrange between Final Year Project and other subject.

In the industries, time management is important. If these kinds of skill do not been look over, it may give a big trouble to us in the future. Furthermore, the planning through this semester is shown by the Gantt chart that is in **Table 1.1**.

Table 1.1: Gantt chart

		Week															
Project Activities		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Briefing about PTA by the	*Plan*																
lecturer	*Actual*																
Choose the Project that	*Plan*																
listed	*Actual*																
Project been given and	*Plan*																
start meet the supervisor	*Actual*																
Do some literature review	*Plan*																
and gather information	*Actual*																
Do the skethcing, gantt	*Plan*																
chart and material listing	*Actual*																
Do the Solidworks and	*Plan*																
Pugh and Metric Chart	*Actual*																
The analysis of the Clothes	*Plan*																
Dryer Machine	*Actual*																
Making progress report and	*Plan*																
mid presentation	*Actual*																
Show progress report and	*Plan*																
solidworks to supervisor	*Actual*																
Continue with the	*Plan*																
fabricating process	*Actual*																
Finish the final report	*Plan*																
and the fabricating	*Actual*																
Start to make the slide	*Plan*																
for presentation	*Actual*																
Present the Final Year	*Plan*																
Project	*Actual*																
Sent the final report	*Plan*																
to the co-ordinator	*Actual*																

CHAPTER 2

LITERATURE STUDY

2.1 INTRODUCTION

A clothes dryer or tumble dryer is a household appliance that is used to remove the moisture from a load of clothing and other textiles, generally shortly after they are cleaned in a washing machine.

Most dryers consist of a rotating drum called a tumbler through which heated air is circulated to evaporate the moisture from the load. The tumbler is rotated relatively slowly in order to maintain space between the articles in the load. In most cases, the tumbler is belt-driven by an induction motor.

2.2 PRODUCT REVIEW

There are two general classes of rotating dryers: electric and gas. Both of these refer to the method used to raise the temperature of the air flowing through the tumbler, since the tumbling action is usually electrically powered.

The electric dryer generally uses a coiled wire that is heated with electric current. The amount of electric current is varied to adjust the air temperature.

The gas dryer employs a gas burner that burns natural gas, propane, or butane to form a jet of hot gases that are directed into a venturi chamber, which uses Bernoulli's principle to pull in ambient air and raise its temperature. The air temperature can be altered by adjusting the size of the gas flame or, more commonly,

by merely extinguishing it and relighting it. Gas dryers require electricity to spin the clothes, but the amount of electricity is much smaller than in an electric dryer removing the need for a special connection.

2.2.1 Spin Dryer

This machine simply spins their drums faster than a typical washer could in order to extract additional water from the load. They may remove more water in two minutes than a heated tumbler dryer can in twenty, thus saving significant amounts of time and energy. Although spinning alone will not completely dry clothing, this additional step saves a worthwhile amount of time and energy for large laundry operations such as those of hospitals.

Figure 2.1: Spin dryer

2.2.2 Condensation dryers

Just as in a normal dryer, condensation dryers pass heated air through the load. However, instead of exhausting this air, the dryer uses a heat exchanger to cool the air and condense the water vapor into either a drain pipe or a collection tank. Afterwards, this air is run through the loop again. The heat exchanger typically uses ambient air as its coolant, therefore the

heat produced by the dryer will go into the immediate surroundings instead of the outside, increasing the room temperature slightly. In some designs, cold water is used in the heat exchanger, eliminating this heating, but requiring increased water usage.

Figure 2.2: Condensation dryer

2.2.3 Dehumidifier Dryers

By keeping a low humidity, dehumidifiers encourage fast evaporation without high heat. This type of dryer is suitable for clothes that can withstand tumbling but not high heat.

Figure 2.3: Dehumidifier dryer

2.2.4 Heat pump dryers

Whereas condensation dryers use a passive heat exchanger cooled by ambient air, these dryers use a heat pump. The hot, humid air from the tumbler is passed through a heat pump where the cold side condenses the water vapor into either a drain pipe or a collection tank and the hot side reheats the air. In this way not only does the dryer avoid the need for ducting, but it also conserves much of its heat within the dryer instead of exhausting it into the surroundings. Heat pump dryers can therefore use less than half the energy required by either condensation or traditional dryers.

Figure 2.4: Heat pump dryer

2.3 HISTORY

Contrary to Internet rumors, the first tumble dryer was not invented by American George T. Sampson. A hand-cranked version was created in 1799 by a Frenchman named Pochon. Sampson's United States patent (number 476,416), which he received on June 7, 1892, was for an improved rack for holding wet clothes near a heat source. Electric tumble dryers appeared in the 20th century.

2.4 MACHINERY

2.4.1 Gas Metal Arc Welding

Gas metal arc welding (GMAW), sometimes referred to by its subtypes metal inert gas (MIG) welding or metal active gas (MAG) welding, is a semi-automatic or automatic arc welding process in which a continuous and consumable wire electrode and a shielding gas are fed through a welding gun. A constant voltage, direct current power source is most commonly used with GMAW, but constant current systems, as well as alternating current, can be used.

a) Equipment

GMAW torch nozzle cutaway image. The image is shown by **Figure 2.5** below:

1. Torch handle
2. Molded phenolic dielectric (shown in white) and threaded metal nut insert (yellow)
3. Shielding gas nozzle
4. Contact tip
5. Nozzle output face

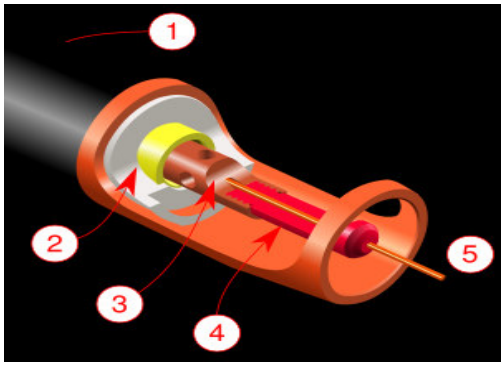

Figure 2.5: GMAW torch nozzle cutaway image

To perform gas metal arc welding, the basic necessary equipment is a welding gun; a wire feed unit, a welding power supply, an electrode wire, and shielding gas supply. **Figure 2.6** below shown the GMAW wire feed unit that also in used to perform the welding process.

Figure 2.6: A GMAW wire feed unit

b) Operation

The operation in the GMAW is easy to understand. How the electrode is burn and joining process is taken also easy to know how does it works. **Figure 2.7** below show how the process happened.

1. GMAW weld area.
2. Direction of travel
3. Contact tube
4. Electrode
5. Shielding gas
6. Molten weld metal
7. Solidified weld metal
8. Work piece

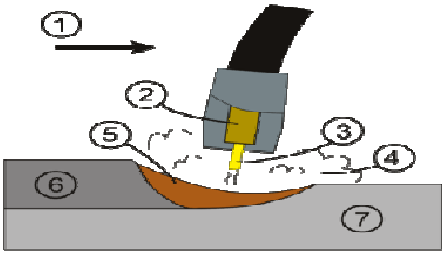

Figure 2.7: Operation of Gas Metal Arc Welding

2.4.2 Drilling

Drilling is the process of using a drill bit in a drill to produce cylindrical holes in solid materials, such as wood or metal. Different tools and methods are used for drilling depending on the type of material, the size of the hole, the number of holes, and the time to complete the operation. From **Figure 2.8** shown of component that usually have in a drilling machine.

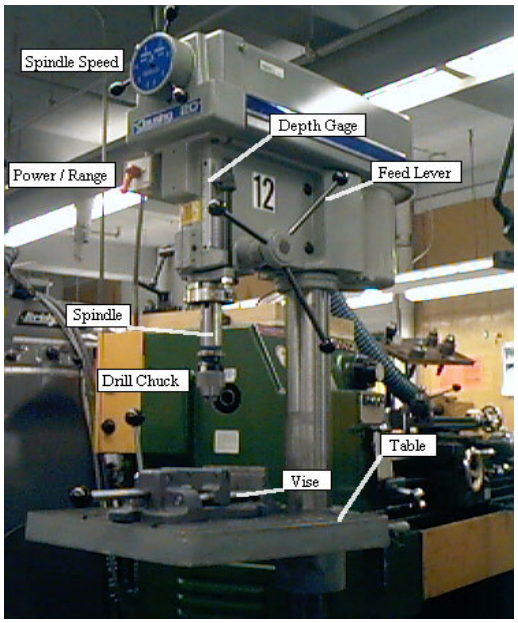

Figure 2.8: Drill machine components